The effects of flexible fixation on early stage bone fracture healing

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The mechanical microenvironment of fracture site could potentially influence the bone fracture healing outcomes. It is known that, should the fixation construct be too stiff, or the gap between the fracture ends be too large, bones are less likely to heal. Flexible fixation or so-called "biological fixation" has been shown to encourage the formation fracture callus, and therefore result in better healing outcomes. However, the nature of the relationship between the degree of mechanical stability provided by a flexible fixation and optimal healing fracture healing outcomes has not been fully understood so far. In this study, we present a computational model to predict the healing outcomes at the early stage of healing under various fixation configurations. The simulation results demonstrate that the change of mechanical microenvironment of fracture site resulting from the different fixation configurations is of importance for the healing outcomes.

Keywords: bone fracture healing; locking compression plate (LCP); interfragmentary strain (IFS); mechanical microenvironment; computational modelling